

We Claim:

1. A video decoding system for receiving a digital bitstream and for decoding the digital bitstream, the system comprising:

5 a video decoder for decoding the digital bitstream to generate a plurality of pictures, each picture being associated with a flag for indicating whether or not the picture is to be reduced in size to picture data prior to being stored;

10 means for converting one or more pictures to picture data;

memory comprising a plurality of buffers, the picture being stored in a buffer as the picture data when the associated flag is armed, and the picture being stored
15 in two or more buffers without size reduction when the associated flag is unarmed; and

recovery means for recovering the pictures from the picture data and for providing the pictures to the video decoder for use during decoding of the digital
20 bitstream.

2. The video decoding system according to claim 1, wherein the associated flag is armed when the picture is an I-picture.

25 3. The video decoding system according to claim 1, wherein the associated flag is unarmed when the picture is a B-picture.

30 4. The video decoding system according to claim 1, wherein the associated flag is armed at times and unarmed at other times when the picture is a P-picture.

5 5. The video decoding system according to claim 4,
 wherein the pictures comprise frames, the flag associated
 with every first P-frame following an I-frame or a B-frame
 is armed, and the flags associated with other P-frames are
 unarmed.

10 6. The video decoding system according to claim 4,
 wherein the pictures comprise fields, and the flags
 associated with up to four P-fields following an I-field or
 a B-field are armed when the first one of said P-fields is
 a top field.

15 7. The video decoding system according to claim 4,
 wherein the pictures comprise fields, the flags associated
 with up to three P-fields following an I-field are armed
 when the first one of said P-fields is a bottom field.

20 8. The video decoding system according to claim 1,
 wherein the pictures comprise frames, the memory can store
 up to two frames, and the buffers comprise four half-frame
 buffers in a circular form.

25 9. The video decoding system according to claim 1,
 wherein the pictures comprise fields, the memory can store
 up to four fields, and the buffers comprise eight half-
 field buffers in a circular form.

30 10. The video decoding system according to claim 4,
 wherein the digital bitstream comprises a progressive-
 refresh bitstream, and the P-pictures include one or more
 refreshed I-slices, and wherein the associated flag is

armed for the P-pictures with the refreshed I-slices at top of the picture.

11. The video decoding system according to claim 1,
5 wherein the pictures comprise HDTV pictures and the picture data comprises SDTV pictures, and the means for converting comprises a down-converter for downscaling the HDTV pictures to the SDTV pictures, and wherein the recovery means comprises an up-converter for upscaling the SDTV
10 pictures to the HDTV pictures.

12. The video decoding system according to claim 1,
wherein the picture data comprises half-vertical resolution (HVR) pictures.
15

13. The video decoding system according to claim 1,
wherein the picture data comprises half-horizontal resolution (HHR) pictures.
20

14. The video decoding system according to claim 13,
wherein the means for converting generates the HHR pictures by averaging each pair of pixels in each horizontal line of the pictures.
25

15. The video decoding system according to claim 13,
wherein the means for converting generates the HHR pictures by selecting every other pixel in each horizontal line of the pictures.
30

16. The video decoding system according to claim 1,
wherein the means for converting comprises a block-based image compressor to compress the pictures in

spatial domain using a gain adaptive compression algorithm to generate the picture data, the picture data comprising compressed bits, and

5 wherein the recovery means comprises a block-based image decompressor to decompress the compressed bits using a gain adaptive decompression algorithm to recover the pictures.

10 17. The video decoding system according to claim 16, wherein the compression and decompression algorithms comprise differential pulse code modulation (DPCM) algorithms.

15 18. The video decoding system according to claim 17, wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process.

20 19. The video decoding system according to claim 18, wherein the quantization tables are generated based on a statistical model of a predictor using Lloyd algorithm.

25 20. The video decoding system according to claim 19, wherein the block-based image compressor comprises a predictor selector for generating the predictor, and wherein the predictor for each pixel of the pictures is determined using Graham rule.

30 21. A method of decoding a digital bitstream, the method comprising the steps of:

decoding the digital bitstream to generate a plurality of pictures, each picture being associated with a flag for indicating whether or not the picture is to be reduced in size to picture data prior to being stored in

5 memory, the memory comprising a plurality of buffers;

converting one or more pictures to picture data;

storing the picture in a buffer as the picture data when the associated flag is armed;

10 storing the picture in two or more buffers without size reduction when the associated flag is unarmed; and

recovering the pictures from the picture data to be used during decoding of the digital bitstream.

15 22. The method according to claim 21, further comprising the step of arming the associated flag when the picture is an I-picture.

20 23. The method according to claim 21, further comprising the step of unarming the associated flag when the picture is a B-picture.

25 24. The method according to claim 21, further comprising the step of selectively arming the associated flag when the picture is a P-picture.

30 25. The method according to claim 24, wherein the pictures comprise frames, and wherein the step of selectively arming the associated flag comprises the steps of arming the flag associated with every first P-frame following an I-frame or a B-frame, and unarming the flags associated with other P-frames.

26. The method according to claim 24, wherein the pictures comprise fields, and wherein the step of selectively arming the associated flag comprises the step of arming the flags associated with up to four P-fields following an I-field or a B-field when the first one of said P-fields is a top field.

27. The method according to claim 24, wherein the pictures comprise fields, and wherein the step of selectively arming the associated flag comprises the step of arming the flags associated with up to three P-fields following an I-field when the first one of said P-fields is a bottom field.

28. The method according to claim 21, wherein the pictures comprise frames, the memory can store up to two frames, and the buffers comprise four half-frame buffers in circular form.

29. The method according to claim 21, wherein the pictures comprise fields, the memory can store up to four fields, and the buffers comprise eight half-field buffers in circular form.

30. The method according to claim 24, wherein the digital bitstream comprises a progressive-refresh bitstream, and the P-pictures include one or more refreshed I-slices, and wherein the associated flag is armed for the P-pictures with the refreshed I-slices at top of the picture.

31. The method according to claim 21,
wherein the pictures comprise HDTV pictures and
the picture data comprises SDTV pictures,
wherein the step of converting comprises the step
5 of downscaling the HDTV pictures to the SDTV pictures, and
wherein the step of recovering comprises the step
of upscaling the SDTV pictures to the HDTV pictures.

32. The method according to claim 21, wherein the
10 picture data comprises half-vertical resolution (HVR)
pictures.

33. The method according to claim 21, wherein the
picture data comprises half-horizontal resolution (HHR)
15 pictures.

34. The method according to claim 33, wherein the
step of converting comprises the step of averaging each
pair of pixels in each horizontal line of the pictures to
20 generate the HHR pictures.

35. The method according to claim 33, wherein the
step of converting comprises the step of selecting every
other pixel in each horizontal line of the pictures to
25 generate the HHR pictures.

36. The method according to claim 21,
wherein the step of converting comprises the step
of block-based image compressing the pictures in spatial
30 domain using a gain adaptive compression algorithm to
generate the picture data, the picture data comprising
compressed bits; and

wherein the step of recovering comprises the step of block-based image decompressing the compressed bits using a gain adaptive decompression algorithm to recover the pictures.

5

37. The method according to claim 36, wherein the compression and decompression algorithms comprise differential pulse code modulation (DPCM) algorithms.

10

38. The method according to claim 37, wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process.

15

39. The method according to claim 38, further comprising the step of generating the quantization tables based on a statistical model of a predictor using Lloyd algorithm.

20

40. The method according to claim 39, wherein the step of block-based image compressing comprises the step of selecting the predictor for each pixel of the pictures using Graham rule.

25

41. A video decoding system for receiving a digital bitstream and for generating a display video stream by decoding the digital bitstream, the system comprising:

30

a video decoder for decoding the encrypted digital bitstream to generate HDTV pictures, the HDTV pictures including one or more anchor pictures;

a block-based image compressor to compress the anchor pictures in spatial domain using a gain adaptive compression algorithm to generate compressed bits;

memory for storing the compressed bits; and

5 a block-based image decompressor to decompress the compressed bits using a gain adaptive decompression algorithm to generate the anchor pictures,

wherein the decompressed anchor pictures are used during the decoding of the digital bitstream.

10

42. The video decoding system according to claim 41, wherein the compression and decompression algorithms are DPCM algorithms.

15

43. The video decoding system according to claim 42, wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process.

20

44. The video decoding system according to claim 43, wherein the quantization tables are designed based on a statistical model of a predictor using Lloyd algorithm.

25

45. The video decoding system according to claim 44, wherein the block-based image compressor comprises a predictor selector for generating the predictor, and wherein the predictor for each pixel of the anchor pictures is determined using Graham rule.

30

46. A method of generating a display video stream using a digital bitstream, the method comprising the steps of:

5 a) decoding the digital bitstream to generate HDTV pictures, the HDTV pictures including one or more anchor pictures;

b) compressing the anchor pictures in spatial domain using a gain adaptive compression algorithm to generate compressed bits;

10 c) storing the compressed bits in memory;

d) decompressing the compressed bits using a gain adaptive decompression algorithm to generate the anchor pictures; and

15 e) repeating steps a)-d) using the decompressed anchor pictures during the decoding of the digital bitstream.

20 47. The method of generating a display video stream according to claim 46, wherein the compression and decompression algorithms are DPCM algorithms.

25 48. The method of generating a display video stream according to claim 47, wherein the coding efficiency of the compression algorithm is accomplished by using a dynamic range of prediction residues for each block to adaptively select one or more quantization tables during compression process.

30 49. The method of generating a display video stream according to claim 48, wherein the quantization tables are designed based on a statistical model of a predictor using Lloyd algorithm.

50. The method of generating a display video stream according to claim 49, wherein the predictor for each pixel of the anchor pictures is determined using Graham rule.

5

51. The method of generating a display video stream according to claim 46, wherein the compression and decompression steps are performed for those anchor frames associated with a flag indicating a reduced memory mode (RMM).

10

TOP SECRET